November 16, 2010

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
SPECIAL PROVISION
FOR

State Project Number: _____

Federal Project Number: _____

FOR
SECTION 601 – STRUCTURAL CONCRETE
MASS CONCRETE

601.1-DESCRIPTION:

ADD THE FOLLOWING SUBSECTION:

601.1.1-Mass Concrete:

Concrete placements whose least dimension exceeds 48.0 inches, excluding Drilled Caissons, tremie seals and Class D Concrete, shall be considered mass concrete and shall conform to the details shown on the plans and these special provisions. For this project, mass concrete placements shall be applicable to the elements identified in the plans.

Compensation for conforming to these requirements will be at no additional cost and shall be included in Pay Items for individual elements identified in the plans.

601.2-MATERIALS:

IN THE TABLE, REMOVE THE FOLLOWING ROW:

MATERIAL	SECTION OR SUBSECTION
* Portland Cement	701.1, 701.3

IN THE TABLE, ADD THE FOLLOWING ROW:

MATERIAL	SECTION OR SUBSECTION
* Portland Cement	701.1, ASTM C150 Type II

**** All coarse aggregate used in mass concrete placements shall be limestone

DELETE THE FOLLOWING SENTENCE:

Unless otherwise permitted by the Engineer, only one source of a pozzolanic additive shall be used in any one structure.

REPLACE WITH THE FOLLOWING SENTENCE:

Sources of each type of pozzolanic additive shall be approved by the Engineer. Multiple sources of the same type of pozzolanic additive shall not be permitted.

601.3-PROPORTIONING:

ADD THE FOLLOWING TO SUBSECTION 601.3.1:

601.3.1 – Mix Design Requirements:

For Mass Concrete placements, the Design Mix shall meet the 28-day compressive strength as specified in the plans. If the 28-day compressive strength obtained in the field does not meet the design 28-day compressive strength requirement, acceptance may be based on a 56-day compressive strength test, if approved by the Engineer after considering the stresses resulting from the construction sequence proposed by the Contractor. Acceptance shall be in accordance to Section 601.4.4 of the Standard Specifications and of this Special Provision, and per the approval of the Engineer.

For Mass Concrete placements, pozzolanic additives may be a combination of the following additives at the substitution rate shown in the following table:

Cementitious Materials	**Maximum percent of total cementitious materials by mass****
Class F Fly Ash	25
Ground Granulated Furnace Slag	50
Total of Fly Ash and Slag	50*

** Total cementitious materials include the summation of Portland Cement, fly ash, slag.

* Fly Ash shall not constitute more than 25-percent of cementitious materials.

A combination exceeding more than two types of pozzolanic additives will not be permitted.

601.4 TESTING

ADD THE FOLLOWING TO SUBSECTION 601.4.4:

601.4.4 – Compressive Strength Tests for Acceptance: Compressive strength acceptance criteria pertaining to Class of Concrete for mass concrete elements may be based on 56-day compressive strength if approved by the Engineer after considering the stresses resulting from the construction sequence proposed by the Contractor.601.12-CURING AND PROTECTING CONCRETE:

ADD THE FOLLOWING SUBSECTION:

601.12.4-Mass Concrete: All mass concrete elements shall be kept completely and continuously moist by means of moisture retention. White polyethylene sheeting meeting the requirements of 707.10 shall be used. The sheeting shall be installed, and joints shall be sealed, so as to prevent as much moisture loss as possible. Water curing shall not be permitted. Curing shall be continued for a period of at least 7 calendar days.

Surfaces may have coverings temporarily removed for finishing, but the covering shall be restored as soon as possible. The installation of curing blankets on mass concrete elements will be required if thermal cracking becomes an issue.

601.12.4.1-Temperature Monitoring System: The temperature monitoring and recording system for mass concrete shall consist of temperature sensors connected to a data acquisition system capable of printing, storing, and downloading data to a computer. Temperature sensors shall be located such that the maximum temperature difference within a mass concrete element can be monitored. As a minimum, for each mass concrete element placement, concrete temperatures shall be monitored at the center of the element, the center of the top face of the element, and at the center of the side face which is furthest from the center of the element.

Temperature readings shall be automatically recorded on an hourly or more frequent basis. A redundant set of sensors shall be installed near the primary set. Provision shall be made for recording the redundant set, but records of the redundant sensors need not be made if the primary set is operational.

Methods of concrete consolidation shall prevent damage to the temperature monitoring and recording system. Wiring from temperature sensors cast into the concrete shall be protected to prevent movement. Wire runs shall be kept as short as possible. The ends of the temperature sensors shall not come into contact with either a support or concrete form, or reinforcing steel.

When any equipment used in the temperature control and monitoring and recording system fails during the mass concrete construction operation, the Contractor shall take immediate remedial measures to correct the situation.

601.12.4.2-Construction: Temperature readings will begin when casting is complete. Temperature readings will continue for 28 days from the time of placement. Data shall be printed and submitted to the Engineer daily. A copy shall be submitted to the Materials Control, Soils and Testing Division for informational purposes.

601.12.4.3-Temperature Control Requirements: The Contractor shall verify to the Division in writing and provide all documentation daily that the temperature control requirements as specified below are met:

Temperature Control Requirements for each mass concrete elements:

i. The Maximum Allowable Temperature Differential shall be limited to 40 degrees F. The temperature differential between the interior (center of the element) and exterior (furthest from the center) portions of the designated mass concrete elements during curing will be maintained to be less than or equal to this Maximum Allowable Temperature Differential, and

ii. The Maximum Allowable Concrete Temperature shall be limited to 160 degrees F.

A change to the Temperature Control Requirements specified above may be proposed by the Contractor and shall be submitted to the Engineer for approval prior to any pour. This submission will include the new proposed Maximum Allowable

Temperature Differential, along with all necessary data providing evidence to satisfactorily demonstrate to the Engineer that the deleterious effects to the concrete can be avoided. The Contractor shall allow seven (7) days for approval.

If the monitoring indicates that the Temperature Control Requirements have been exceeded then a penalty shall be assessed for bullets (i) and (ii) above, independently as follows:

> $100 / degree F or fraction there-of the allowable temperature range multiplied by the number of yards in the element.

No extension of time or compensation will be made for any rejected or penalized mass concrete element.